Tooth notation:
Upper right first permanent molar

By Prof. James Prichard, UK

Patient Symptoms
Severe pain (Visual Analogue Scale 9 out of 10). Poorly localized on the right hand-side. Always starting on the upper right hand side of the face. Pain radiates in to the ear and the cheek on the right hand-side. Pain is spontaneous and not responding well to over the counter analgesics (ibuprofen 400mg qds). Pain has been gradually getting worse over the last 48 hours. The patient was experiencing sleep disturbance and the pain came on in waves. Extreme sensitivity to cold stimulus, not so painful with hot.

Examination
Upper right first and second molars are restored with amalgam. No pocketing or mobility and no tenderness to percussion. No tender ness in the buccal or palatal sulcus. Sensitivity testing with EndoFrost: UR7 ++, UR6 ++ and triggered the patients toothache.

Pre-operative radiograph
Upper right first molar has a pin retained restoration, 25% bone loss medially and distally, no obvious caries, a possible furcal radiolucency but no obvious peri-apical radiolucency at the root apices. The pulp chamber is reduced in size and the canals are not obviously visible. The mesial root exhibits severe curvature in excess of 30° (Schneider 1971- Figure 1[b]) towards the distal aspect. The sinus outline appears to be low and in close approximation to the roots.

Diagnosis
Acute irreversible symptomatic pulpitis from the upper right first molar.

Treatment Options
Root canal treatment or extraction. The patient opted for root canal treatment.

Treatment
Anaesthesia was achieved with 1x 2.2 ml Lignospan (2% Lidocaine, 1:80,000 adrenaline) via buccal and palatal infiltration and isolation achieved with non latex dam (3M) and sealed with Oraseal (Optident) caulking agent.

Access was performed with a short tungsten carbide bur and the pulp chamber de-roofed with a safe ended tapered tungsten carbide bur (FKG). There was a pulp stone present in the chamber over the palatal root canal (Figures 2[a] and [b]) which was removed with a CAP 1 Canal Access Preparation) ultrasonic tip (Acteon UK) and 3 canals were immediately identified with a DG16 endodontic probe.

Before canal shaping was performed the coronal 2/3rd was explored with a size 10 K-Flex file. Shaping was performed as follows:

“ScoutRace” (FKG Dentaire) sizes 10/02, 15/02 and 20/02 (Figure 1) were used in an NSK Endomate (NSK) running at 1000 rpm to estimated working length using 3% Sodium Hypochlorite-NaOCl (FKG) as the lubricant and irrigant. The irrigant was delivered with a 27G side vented Monoject needle attached to a 3ml syringe.

Fig. 1a Fig. 1b

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The canal lengths were determined electronically with an Apex RNR apex locator (Medic NRG) using a 5-mm-taper file (Dentsply Maillefer) and shaped with BioRace (FKG Dentaire) R60, R1, R8, BR1, and BR6 and sequenced to length irrigating with 3% NaOCl between each file.

After shaping, the root canals were cleaned with the Tristreme Passive Ultra- sonic Irrigation Tip (Acteon UK) for 3 cycles of 20 seconds per canal re-plenishing the irrigant between each cycle (Figure 3). Following which a soak was performed with 17% EDTA (FKG) for 60 seconds before drying and the final flush was made with 5% NaOCl.

Obturation was performed with To- tafill BC Sealer (FKG Dentaire) and size 3/4, 04 Totalfill BC Points, gutta percha cones impregnated with bi-oceramic. The cones were sized to fit each individual canal with good tug back in canals still wet with 3% sodium hypochlorite. The canals were dried with 35/40 paper points (FKG), the cones were coated with Totalfill BC Sealer (Figure 5) and seated into the canals, withdrawn half way and reseeded. The coronal portion of the obturated canal was heated with an instrument and packed gen- tly into the canal orifices (Figure 6 and Figure 7), and the access cavity cleaned by washing with a 3% tiv ti- syringe.

An amalgam Nayyar core was placed, the dam removed and the occlusion checked. A final radiograph was taken (Figure 8) showing a well-con- densed root canal filling in all 3 ca- nals extending to length with a well-adapted coronal restoration.

Discussion
The diagnosis of acute symptomatic irreversible pulps can sometimes be difficult, however by repeating the patients sensitivity to cold it soon became apparent which tooth was causing the trouble. The best way to treat this is to remove the inflamed tissue as quickly as pos- sible; antibiotics have no place, as there isn’t an infection.

The narrowness of the canals and the severe curvature on the mesial root can make instrumentation challeng- ing. Scissors of canals takes place as a result of deposition of secondary dentine and progressive deposition of calcified masses that originate in the root pulp (Barrick & Nedelman 1973), and true pulp stones are made of dentine and lined by odontoblasts (Johnson & Bevelder 1956)

Pulp stones are common, ranging from 4% of first molars Chandler et al. 2003 to 78% of primary molars

Arys et al. 1993, and vary in size from 50 μm in diameter to several milli- metres when they may occlude the entire pulp chamber (Shyag & Bred 1968). Therefore if the pulp stone is not removed, the natural canal anatomy may be obscured making shaping and disinfection difficult or impossible.

Shaping canals is essential to endo- dontic success (Schilder 1984), but nickel titanium files are prone to cy- clic fatigue fracture and tortuosity tip files and providing an apical seal in Glide path creation is essential when shaping with rotary Nickel-Titanium in- struments to the clinical guidelines (Patino et al. 2005) and mechanical glide path instrumentation (Shayegh et al. 2010) as shown in Figures 5 and 7. The canal lengths were determined sequentially to length irrigating with 3% NaOCl.


Bioceramics (tricalcium silicates) have many uses in endodontics, taking shape for the ultrasonic tip to vibrate thereby reducing tooth con- tact dampening (Ahmad et al. 1991) which in turn improves the acoustic micro-streaming (Ahmad et al. 1987) and increases the reduction in bacteriol- ogic load (Bhuvnesh et al. 2013, 2015).


Scourtease - use in canals with severe curves where it is difficult to get a hand file longer than #4 or #6 to working length.

Chandler NP, Pitt Ford TR, Monteith LA, Versluis M, Lambrechts P. Mechanical instrumentation in endodontic ther- apy. British Association of Endodontic Educators Academy and a Fellow of the British Dental Association. He has supervised postgraduate students in En- dodontics and has held several ex- tensive courses, lectures and seminars through- out the UK and overseas. He has held the posts of Associate Clinical Teacher, Clinical Teacher at the University of Warwick and Clinical Supervisor in Endodontics on the Masters Programme at The University of Warwick prior to join- ing BUP Dentistry in London as Visiting Professor and Programme Leader for the MSc in Endodontics. He has several endodontic companies and has contributed the latest advances in endodontic literature review – Part III. clinical applications, drawbacks, and mecha- nism of action. Journal of Endodontics 2010, 36, 400-13.

Fig. 2a Fig. 2b Fig. 4

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Laser Enhanced Endodontic Treatment

By Dr Gregorio M. Kurtzman, USA

Endodontic success is predicated on the ability to debride and clean the canal system. That canal system is a complex array of accessory and lateral canals, interradicular areas inaccessible to endodontic files. (Figure 1) As practitioners, we are able to clean the main canals with files, either hand or rotary, but can neither mechanically remove pulp tissue and debris in the canal system, nor remove that debris from the canal walls. NaOCl and EDTA treatment modalities do not allow for this. This means that even with effective irrigation and rotary instrumentation, we cannot fully remove debris from the canal anatomy. This debris can lead to postoperative pain, endodontic retreatment, and failure.

Endodontic failure is linked to the residual debris within the canal. (Figure 2) This debris can consist of infected dentin, saliva, bacteria, and other residues. These remnants can block the apical foramen and obturated canal system, respectively. As a result, the irrigant cannot effectively reach the apical extent of the canal system.

The Laser-Touch™ Er:YAG Laser

The Laser-Touch™ Er:YAG Laser is a photomechanical instrument designed to enhance endodontic access and debridement. (Figure 3) By combining mechanical debridement with laser activation, this system provides a unique way to access and clean the root canal system.

Photomechanical Irrigation

Photomechanical Irrigation is used to enhance access to the pulp chamber, which can be achieved by mechanical means such as rotary files, ultrasonic tips, or laser energy. The Laser-Touch™ Er:YAG Laser is used to generate laser energy that is activated using a "LiteTouch" delivery system. This delivery system is comprised of a delivery tip and an activation system that can be placed into the chamber and canals during instrumentation. The laser energy can be used to activate the irrigation solution, killing bacteria within the canal system. This allows for better bacterial access and removal, leading to improved success rates.

Laser-Assisted Canal Irrigation

Laser-Assisted Canal Irrigation is used to enhance the effectiveness of irrigation solutions such as NaOCl and EDTA. The Laser-Touch™ Er:YAG Laser is used to generate laser energy that is activated using a "LiteTouch" delivery system. This delivery system is comprised of a delivery tip and an activation system that can be placed into the chamber and canals during instrumentation. The laser energy can be used to activate the irrigation solution, killing bacteria within the canal system. This allows for better bacterial access and removal, leading to improved success rates.

Laser-Assisted Apical Debridement

Laser-Assisted Apical Debridement is used to enhance the effectiveness of irrigation solutions such as NaOCl and EDTA. The Laser-Touch™ Er:YAG Laser is used to generate laser energy that is activated using a "LiteTouch" delivery system. This delivery system is comprised of a delivery tip and an activation system that can be placed into the chamber and canals during instrumentation. The laser energy can be used to activate the irrigation solution, killing bacteria within the canal system. This allows for better bacterial access and removal, leading to improved success rates.

Laser-Assisted Root Canal Refilling

Laser-Assisted Root Canal Refilling is used to enhance the effectiveness of irrigation solutions such as NaOCl and EDTA. The Laser-Touch™ Er:YAG Laser is used to generate laser energy that is activated using a "LiteTouch" delivery system. This delivery system is comprised of a delivery tip and an activation system that can be placed into the chamber and canals during instrumentation. The laser energy can be used to activate the irrigation solution, killing bacteria within the canal system. This allows for better bacterial access and removal, leading to improved success rates.

Conclusion

The Laser-Touch™ Er:YAG Laser is a photomechanical instrument designed to enhance endodontic access and debridement. It is a powerful tool that can be used to improve success rates and reduce the risk of root canal treatment failure.
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